SPLENECTOMY-AN ANALYSIS OF VARIOUS INDICATIONS

A Dissertation Submitted to

The Tamil Nadu Dr. M.G.R. Medical University,

In partial fulfillment of the regulations for the award of the Degree of

MASTER OF SURGERY (GENERAL SURGERY)

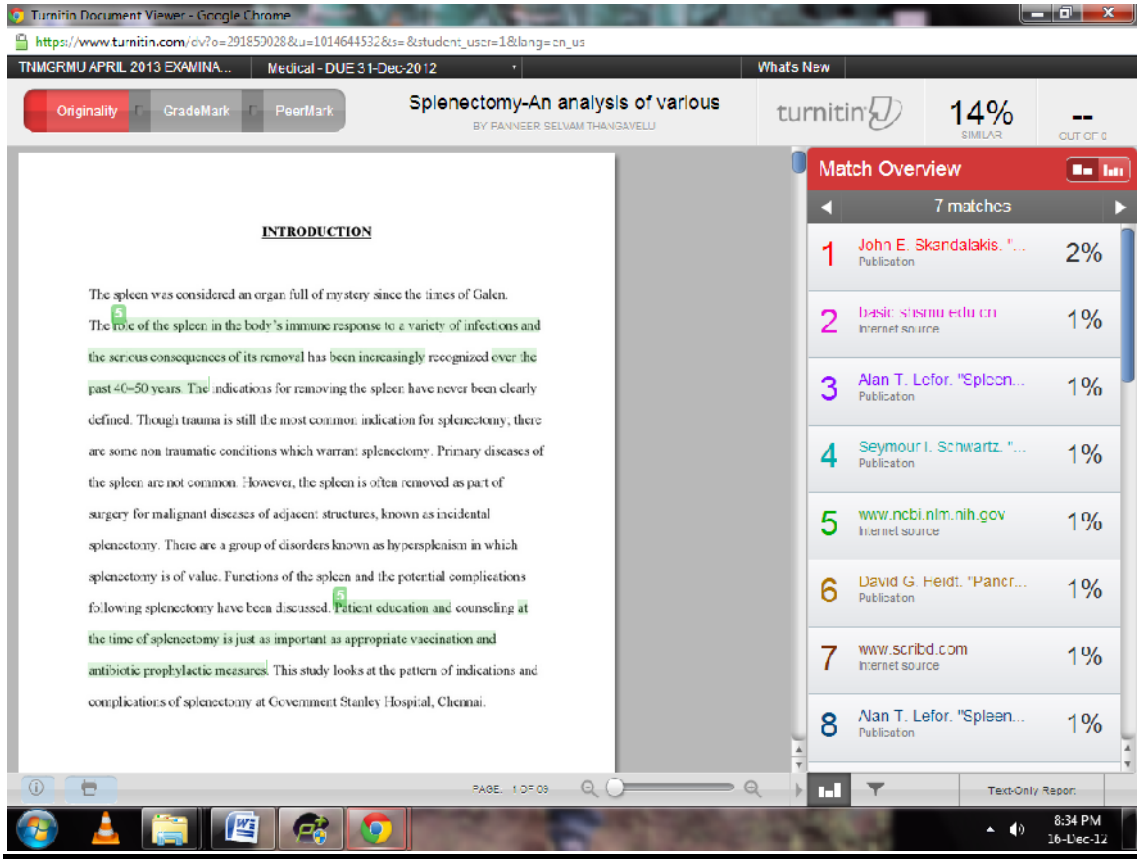
Branch I: M.S. (Gen Surg)

Department of General Surgery,

GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL,

Chennai – 600 001.

April 2013


Turnitin Document Viewer - Google Chrome
https://www.turnitin.com/dv?o=291850028&u=1014644532&s=&student_user=1&lang=en_us
TNMGRMU APRIL 2013 EXAMINA...
Medical - DUE 31-Dec-2012
What's New
Originality
GradeMark
PeerMark
Splenectomy-An analysis of various
BY PANNEER SELVAM THANGAVELU
turnitin
14%
SIMILAR
--
OUT OF 0
INTRODUCTION
The spleen was considered an organ full of mystery since the times of Galen. The role of the spleen in the body's immune response to a variety of infections and the serious consequences of its removal has been increasingly recognized over the past 40–50 years. The indications for removing the spleen have never been clearly defined. Though trauma is still the most common indication for splenectomy, there are some non traumatic conditions which warrant splenectomy. Primary diseases of the spleen are not common. However, the spleen is often removed as part of surgery for malignant diseases of adjacent structures, known as incidental splenectomy. There are a group of disorders known as hypersplenism in which splenectomy is of value. Functions of the spleen and the potential complications following splenectomy have been discussed. Patient education and counseling at the time of splenectomy is just as important as appropriate vaccination and antibiotic prophylactic measures. This study looks at the pattern of indications and complications of splenectomy at Government Stanley Hospital, Chennai.
Match Overview
7 matches
1 John E. Skandalakis. "... Publication 2%
2 Internet source 1%
3 Alan T. Lefor. "Spleen... Publication 1%
4 Seymour I. Schwartz. "... Publication 1%
5 www.ncbi.nlm.nih.gov Internet source 1%
6 David G. Heidt. "Pancr... Publication 1%
7 www.scribd.com Internet source 1%
8 Alan T. Lefor. "Spleen... Publication 1%
PAGE: 1 OF 09
Text-Only Report
8:34 PM
16-Dec-12

INSTITUTIONAL ETHICAL COMMITTEE,
STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Splectomy – An analysis of the various indications

Principal Investigator : Dr. T. Panneer Selvam

Designation : PG in MS(Gen.Sur)

Department : Department of Gen. Sur
Government Stanley Medical College,
Chennai-1

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 06.03.2012 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

MEMBER SECRETARY,
IEC, SMC, CHENNAI

CERTIFICATE

This is to certify that Dr. T. PANNEERSELVAM , postgraduate student (May 2010 – April 2013) in the department of General Surgery, Stanley medical college, Chennai, has completed his dissertation titled ***"SPLENECTOMY- AN ANALYSIS OF VARIOUS INDICATIONS "*** under the direct guidance and supervision in partial fulfillment of the regulations laid down by the Tamilnadu Dr.M.G.R. Medical University, Chennai for M.S., Branch – I General surgery degree examination

Prof. Dr. P. DARWIN M.S
Ph.D.,
Prof & Head of Department
General Surgery
Govt Stanley Medical College
Chennai – 600 001

Prof. Dr. S. Geethalakshmi M.D

DEAN
Govt Stanley Medical College,
Chennai – 600 001

DECLARATION

I, Dr.T. PANNEERSELVAM , solemnly declare that the dissertation titled "***SPLENECTOMY-AN ANALYSIS OF VARIOUS INDICATIONS"*** is a bonafide work done by me at Govt. Stanley Medical College and Hospital under the guidance and supervision of my unit chief,

Prof. Dr. P. DARWIN, M.S
Professor of General Surgery

This dissertation is submitted to the Tamilnadu Dr. M.G.R. MEDICAL UNIVERSITY towards the partial fulfillment of the requirements for M.S., Branch I General Surgery degree examination.

Place: Chennai – 600001
Date: Dr.
T.PANNEERSELVAM

ACKNOWLEDGEMENTS

.

I sincerely thank **Prof. Dr. S. Geethalakshmi, M.D., PhD**, The Dean, Govt. Stanley Medical College & Hospital for permitting me to carry out this study, and also to the Institutional Ethical Committee for having approved this proposal.

I owe my gratitude to **Prof. Dr. P. Darwin, M.S.**, the Professor & Head of Department of General Surgery, Govt Stanley Medical College & Hospital, for coordinating my project work and guiding me throughout to pursue and accomplish the task.

I am indebted to my Assistant Professors: **Dr. Kumaran, M.S,M.Ch, Dr. R. Uthirakumar, M.S, D.A, Dr. C. Arun Babu, MS, MRCS**, **Dr. R. Vijayalakshmi, MS, DGO**, and **Dr. D.S. Kumaresan, MS, MRCS** who helped me in every step and for encouraging me. I acknowledge my other colleagues too for their kind cooperation and their contributions.

My heartfelt thanks to my patients for unconditionally and freely consenting to be a part of this trial aimed to achieve better post-surgical outcomes.

CONTENTS

INTRODUCTION

INTRODUCTION

The spleen was considered an organ full of mystery since the times of Galen. The role of the spleen in the body's immune response to a variety of infections and the serious consequences of its removal has been increasingly recognized over the past 40–50 years. The indications for removing the spleen have never been clearly defined. Though trauma is still the most common indication for splenectomy; there are some non traumatic conditions which warrant splenectomy. Primary diseases of the spleen are not common. However, the spleen is often removed as part of surgery for malignant diseases of adjacent structures, known as incidental splenectomy. There are a group of disorders known as hypersplenism in which splenectomy is of value. Functions of the spleen and the potential complications following splenectomy have been discussed. Patient education and counseling at the time of splenectomy is just as important as appropriate vaccination and antibiotic prophylactic measures. This study looks at the pattern of indications and complications of splenectomy at Government Stanley Hospital, Chennai.

REVIEW OF LITERATURE

OVERVIEW:

1816: O’Brien performed the first splenectomy for trauma (knife wound) in the United States.

1846: Rudolph Virchow demonstrates that the follicles in the spleen are related to the white blood cells.

1918 : Pearce published his classic book *The Spleen and Anaemia* stating that splenectomy was indicated for Banti's diseases, pernicious anaemia, haemolytic jaundice, Gaucher's disease, trauma, cysts, tuberculosis, syphilis, and wandering spleen.

1944: de Gray produced a case report of splenectomy and the patient recovered as expected but died thirteen years later of pneumonia (the earliest reported case of Overwhelming Post-Splenectomy Infection [OPSI]).

1963: Coler provided the first reported deaths of splenectomised children succumbing to overwhelming post-splenectomy sepsis.

1970: Najjar discovered "tuftsin," a splenic peptide associated with immunity.

EMBRYOGENESIS OF THE SPLEEN

Normal Development:

The mesoderm is responsible for the genesis of the spleen, the largest of the lymphatic organs. Around the fifth week of gestation, mesenchymal cells between the leaflets of the dorsal mesogastrium and the cells of the coelomic epithelium of the dorsal mesentery form the early spleen.[13]

The spleen is located between the leaves of the dorsal mesogastrium, and occupies this location in adult life. The left side of the dorsal mesogastrium gives rise to the splenic ligaments. Mesenchymal cells differentiate to form both the capsule and a connective tissue framework.[8]

At 10 to 20 days, differentiation to true epithelium with visible basement membrane is evident. Clefts of mesenchymal origin (sinusoids without endothelial lining) are present at 29 to 30 days; they show evidence of communication with the capillaries. The spleen assumes its characteristic shape in the early foetal period; foetal lobulation normally disappears late in the prenatal period.

At 13th week, surface immunoglobulin-bearing B cells and erythrocyte rosette-forming T cells emerge. Immunoglobulin A is not

synthesized during foetal life, but IgM and IgG antibodies are synthesized during the third trimester.

The red pulp develops at the periphery of the lobules. There is also an accumulation of lymphocytes, monocytes, and macrophages (white pulp) during the second trimester around the central arteries.

CONGENITAL ANOMALIES

Asplenia:

Associated with several other congenital anomalies. Asplenia is autosomal recessive, while splenic hypoplasia is autosomal dominant.

Polysplenia:

Normal spleen is present but is joined by one, two, or more splenic nodules of small size that are completely separated from the main organ.

Wandering Spleen:

Due to excessive splenic mobility caused by laxity of spleen's supporting ligaments and elongated splenic vessels. The wandering spleen is susceptible to infarction as a result of twisting about its elongated vascular pedicle.

Accessory Spleens:

Accessory spleens are made of blood, sinuses, and malpighian bodies. They receive their blood supply from the splenic artery. Most common sites are hilum of the spleen, the gastrosplenic ligament, splenorenal ligament, and the greater omentum.

Splenosis:

Splenic tissue in the peritoneal cavity may be produced by auto transplantation secondary to injury. Most cases are asymptomatic. Intestinal obstructions from adhesions, pain resulting from torsion, and stomach masses simulating carcinoma have been reported.

SURGICAL ANATOMY OF THE SPLEEN:

It resides in the posterior portion of the left upper quadrant lying deep to the ninth, tenth, and eleventh ribs, with its long axis corresponding to that of the tenth rib.[2]

Dimensions -1 x 3 x 5 inches (2.5 x 7.5 x 12.5 cm)

Weight -7 oz (220 g).

he spleen has three surfaces: phrenic, gastric, and renal.

It is covered by a thin capsule that is derived from the deeper organ pulp.

PERITONEUM AND LIGAMENTS OF THE SPLEEN:

The right and left layers of the greater omentum separate to enclose the spleen almost completely, except at the hilum.[9]

Gastrosplenic Ligament:

The more cranial part of the gastrosplenic ligament contains the short gastric arteries, and the more caudal part contains the left gastroepiploic vessels.[1]

Splenorenal Ligament:

The splenorenal ligament is the posterior portion of the primitive dorsal mesogastrium. It envelops the splenic vessels and the tail of the pancreas.[1]

Splenophrenic Ligament:

It is a reflection of the gastrosplenic ligament to the diaphragm and posterior abdominal wall.[4] It may contain the tail of the pancreas and all the splenic vessels, including the root of the left gastroepiploic artery if it reaches the hilum. It is usually avascular.

Splenocolic Ligament:

The splenocolic ligament is a remnant of the transverse mesocolon which attaches to the spleen during embryonic fixation of the colon to the body wall.[1] Aberrant inferior polar vessels of the spleen or a left gastroepiploic artery can lie close to it.[9]

Phrenicocolic Ligament:

The ligament fixes the splenic flexure in place and prevents the downward displacement of spleen.

ARTERIAL SUPPLY:

SPLENIC ARTERY:

It is a branch of the celiac trunk, arising together with the common hepatic and left gastric arteries.[1] The most common form of the celiac trunk is tripodal. The splenic artery courses leftward in close relation to the upper border, front of or completely behind the pancreas.

Branches of the Splenic Artery: there are two main branches.

1)Short Gastric Arteries:

Arise from the left gastroepiploic artery or from splenic branches. The short gastric arteries anastomose with the cardiac branches of the left gastric artery. The short gastric arteries provide sufficient circulation to

sustain just the upper third of a normal-sized spleen following removal of the lower two-thirds of the spleen.

2)Left Gastroepiploic Artery:

The left gastroepiploic artery arises from the splenic trunk mostly and rarely from branches of splenic artery.[16]

OTHER BRANCHES OF THE SPLENIC ARTERY:

Posterior Gastric Artery:

This artery arises from the main stem of the splenic artery before the splenic hilum.[15] It supplies the fundus and upper part of body of stomach.

Dorsal Pancreatic Artery:

It has a branch to the right, which anastomoses with arteries on the ventral surface of the head of the pancreas. It provides origin to the transverse pancreatic artery.

Transverse Pancreatic Artery:

The transverse pancreatic artery is the left branch of the dorsal pancreatic artery supplying the body and tail of the pancreas.[11]

Great Pancreatic Artery :

It arises from the midportion of the splenic artery. It is the chief blood supply of the distal body and tail of the pancreas.[1]

Caudal Pancreatic Artery:

It arises from terminal part of the splenic artery, or from the left gastroepiploic artery[1]. The caudate branch anastomoses with branches of the great pancreatic and transverse pancreatic arteries.

VENOUS DRAINAGE:

The splenic vein originates from multiple tributaries at the hilum. The vein passes through the splenorenal ligament with the artery and the tail of the pancreas, deep to the pancreas. The splenic vein receives tributaries from the pancreas. Deep to the region of the neck of the pancreas, the splenic vein which usually receives the inferior mesenteric vein centrally and joins the superior mesenteric vein to form the portal vein.

LYMPHATIC DRAINAGE:

The lymphatic vessels of the spleen arise from the splenic capsule and some of the splenic trabeculae.[4] There are two main groups: the nodes

of the splenic hilum and the nodes of the tail of the pancreas. The hilar lymph nodes drain the lymph of the stomach rather than that of the spleen. The splenopancreatic nodes are located along the splenic artery.[17] The local lymph nodes receive lymph from the spleen, the stomach and the pancreas.

SPLENIC INNERVATION:

Visceral nerve fibre from celiac plexus accompanies the splenic vessels into the hilum. The right vagus nerve or the posterior vagal trunk also supply the spleen.[1]

HISTOLOGY:

The spleen is composed of 75-85% red pulp and 20 % white pulp. It is surrounded by a tense capsule and interspersed with trabeculae.

The red pulp:

Consists of a loose reticular tissue rich in capillaries and venous sinusoids. Sinusoids have a unique endothelium of longitudinally arranged cells –central to filtration function. Splenic macrophages in the intercellular gaps of the red pulp phagocytise damaged red blood cells and particulate matter.[8]

The white pulp:

It comprises a central trabecular artery surrounded by nodules with germinal centers and periarterial lymphatic sheaths that provide a framework filled with lymphocytes and macrophages. It also contains a marginal zone and lymphoid follicles.

There are two types of circulation in the spleen:

-open circulation (90%) in which blood flows from arteries to cords, and then sinuses.

-closed circulation (10%) in which the blood flow through the spleen bypassing the cords and sinuses by direct arteriovenous communications.

Physiology:

The spleen receives 300 mL/min of blood. The functions of spleen are

Immune function:

The spleen is the major site of specific immunoglobulin M (IgM) production. It also synthesizes opsonins (tuftsin, properdin, and fibronectin).Tuftsin stimulates white cell motility and phagocytosis. Properdin activates the alternate pathway of the complement system and leads to complement fixation and target cell destruction. Fibronectin is a macromolecule that appears to stimulate fibrosis and wound healing

nonspecifically, as well as stimulating white blood cell motility and phagocytosis.[6] These antibodies are of B- and T-cell origin and bind to the specific receptors on the surface of macrophages and leucocytes, stimulating their phagocytic, bactericidal and tumoricidal activity. Splenic phagocytes synthesize the majority of components of the classical pathway of complement. The spleen is also the major site of clearance of encapsulated organisms, which are not effectively cleared in asplenic hosts, a problem that puts these people at increased risk of sepsis secondary to these organisms. In addition, the spleen has been shown to clear metastatic cells from the circulation.

Filter function:

Macrophages in the reticulum capture cellular and non-cellular material from the blood and plasma (defective platelets and red blood cells). Iron is removed from the degraded hemoglobin during red cell breakdown and is returned to the plasma.

Pitting:

The process of removing intra-erythrocyte inclusions without destroying the cell is known as pitting (Howell–Jolly and Heinz bodies).[5] The repaired red cells are returned to the circulation. The postsplenectomy blood smear is characterized by the presence of circulating erythrocytes with Howell-Jolly and Pappenheimer bodies (siderotic granules).

Reservoir function:

The spleen contains approximately 8% of the red blood cell mass and also platelets. An enlarged spleen may contain a much greater proportion of the blood volume. At any given time, about one third of the total platelet mass is in the spleen.[2]

Cytopoiesis:

Haematopoiesis occurs in the fetal spleen from 4th month of gestational period. It ceases by the seventh intrauterine month. Stimulation of the white pulp results in the proliferation of T and B cells and macrophages. This may also occur in myeloproliferative disorders, thalassemia and chronic hemolytic anaemias.

Culling:

It is the spleen's ability to remove red cells that are aged or abnormal. Normally, the red cell after 120 days loses osmotic balance and membrane integrity and therefore deformability and is phagocytized by native macrophages. There is no difference in red cell survival following splenectomy

INDICATIONS FOR SPLENIC SURGERY:

Trauma:

It is divided into blunt and penetrating injuries.

The spleen is the most commonly injured organ by blunt trauma. It is associated with rib fractures or contusions of the left flank or lower left chest. A chest roentgenogram may show these injuries as an elevated diaphragm, rib fractures, or pleural effusion..

The diagnostic modalities include computed tomography (CT) or ultrasonography (FAST). Penetrating trauma injures the spleen much less frequently because of the small size of the organ and its protected location.

Nonoperative management of blunt splenic injury in hemodynamically stable patients with no other associated abdominal injuries has emerged as the most common method of splenic conservation. Penetrating splenic injuries usually are associated with concomitant injuries to other organs and need emergency exploratory laparotomy. 10% to 30% of splenic injuries occur intraoperatively by spontaneous rupture of an enlarged spleen. Patients with spontaneous rupture have abnormal spleens and no history of trauma. The common causes are malaria and

infectious mononucleosis, sarcoidosis, leukaemia, and congestive splenomegaly.

The non-traumatic indications for splenectomy are

- Hypersplenism
- En bloc resection for malignant infiltration from adjacent structures.
- Congenital anaemia
- Portal hypertension.
- Hodgkin's disease
- Splenic vein thrombosis.
- Splenic cyst
- Splenic abscess
- Tumours.

HYPERSPLENISM:

One of the main functions of the spleen is to remove the damaged blood elements, and diseases of the spleen can cause an acceleration in this removal.[6] If rapid destruction and removal involves one of the three elements — red blood cells, white blood cells, or platelets — the result is anaemia, leucopoenia, or thrombocytopenia, respectively. If this, the process results in pancytopenia.

Hypersplenism is an exaggeration of the normal splenic physiologic state. It results in accelerated destruction involving all three blood elements. The syndrome is characterized by

-splenomegaly,

-decrease in circulating levels of one or more of the blood lines,

-Compensatory increase in bone marrow activity resulting in increased cell turnover of the affected cell lines.

-Usually improvement of disease following splenectomy.

PRIMARY HYPERSPLENISM:

It is a diagnosis of exclusion. No apparent aetiology can be identified in spite of multiple investigations.

SECONDARY HYPERSPLENISM:

It is associated with a specific disease process. Diseases commonly associated with secondary hypersplenism are

Congestive splenomegaly:

- Cirrhosis.
- Extra hepatic portal venous obstruction.

- Non cirrhotic portal fibrosis.
- Splenic vein thrombosis.
- Portal hypertension.

Malignancy:

- Primary tumours.
- Metastatic disease.
- Lymphoma.
- Leukaemia.

Chronic inflammatory disease:

- Sarcoidosis.
- Systemic lupus erythematosis.
- Felty’s syndrome.
- Amyloidosis.
- Gaucher’s disease.
- Niemann pick’s disease.

Infections:

- Tuberculosis.
- Infectious mononucleosis.
- Malaria.
- Kala azar.

Chronic haemolytic diseases:

- Hereditary spherocytosis.
- Thallasemia.
- Elliptocytosis.
- Idiopathic thrombocytopenic purpura.

Most patients with hypersplenism do not have splenomegaly (more than 90%). Fewer than 10% of patients with splenomegaly have hypersplenism. Almost all patients with splenomegaly who require surgery have hypersplenism, splenic infarction, or splenic rupture as the precipitating indication for a splenectomy

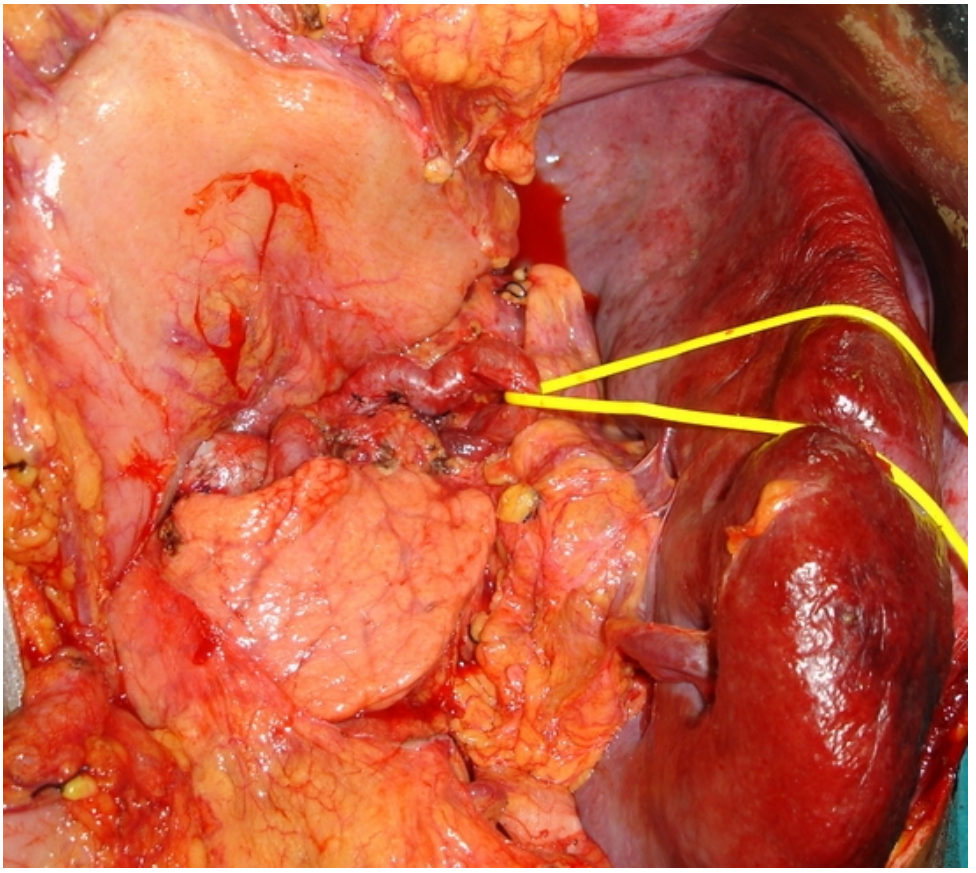


Fig1: Extra hepatic portal venous obstruction. Massive splenomegaly, splenic vein being isolated for spleno renal shunt.

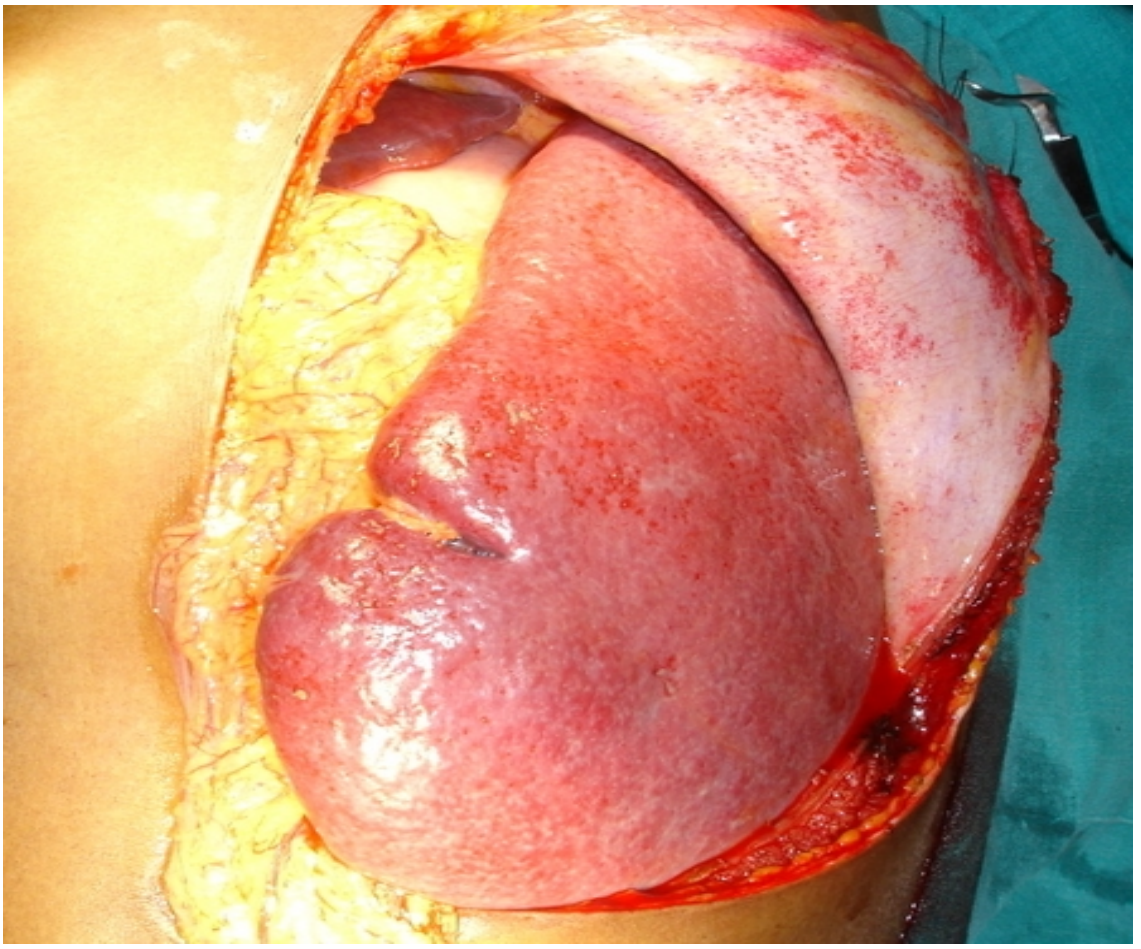


Fig2: Non cirrhotic portal fibrosis causing hypersplenism.

ENBLOC RESECTION:

It includes the resection of spleen along with a neighboring organ due to direct infiltration of the primary malignancy. Most common tumors whose removal necessitates splenectomy are stomach(Fig 3,4), left kidney, tail of pancreas (Fig 5)and any retroperitoneal tumor. Sometimes these tumors can cause a left sided portal hypertension due to involvement of splenic or portal vein. These are also known as 'incidental' splenectomies. They are more common than surgery for primary splenic pathology.

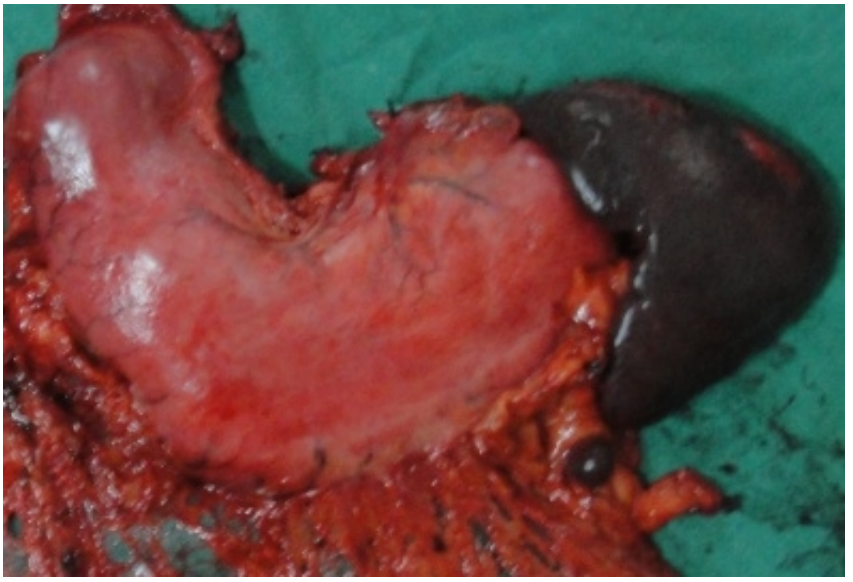


Fig 3: Total gastrectomy with splenectomy for carcinoma stomach (fundus). Also seen a spleniculi in greater omentum.

Fig4: Total gastrectomy with distal pancreatectomy and splenectomy for carcinoma stomach infiltrating into tail of pancreas and splenic vessels.

Fig5: distal pancreatectomy and splenectomy for mucinous cyst adenoma tail of pancreas.

THALASSEMIA:

Thalassemia (Mediterranean anemia) is a congenital disorder transmitted as a dominant trait in which the anemia is the result of a defect in hemoglobin synthesis leading to premature red cell destruction. The characteristic feature is the persistence of Hb-F and a reduction of Hb-A. The patients present with chronic anemia, jaundice, and splenomegaly. Retarded body growth, intractable leg ulcers and intercurrent infections are common. Therapy is directed only at symptomatic patients, those having thalassemia major or intermedia. In these patients, transfusions are usually required at regular intervals. Splenectomy is the treatment of choice.

SICKLE CELL DISEASE:

In this disorder, the normal hemoglobin A is replaced by hemoglobin S.[25] Under conditions of reduced oxygen tension, hemoglobin S molecules undergo crystallization within the cell, which elongates and distorts the cell. The sickle cells increase the blood viscosity and circulatory stasis, thus establishing a vicious cycle. Sickling occurs so rapidly that micro infarcts develop. In most adult patients only a fibrous area of the spleen remains, but autosplenectomy is preceded by splenomegaly in about 75% of patients.

HEREDITARY SPHEROCYTOSIS:

Most common hemolytic anemia requiring splenectomy.[3] Autosomal dominant disease causing defective erythrocyte membrane components (spectrin, ankyrin, band 3) resulting in abnormal shapes of RBC's. They get trapped and destroyed while passing through the spleen. Symptoms are anemia, reticulocytosis, jaundice, and splenomegaly.[7] Diagnosis made by peripheral blood smear. Splenectomy removes the splenic filter that destroys the cells, and improves the red blood cell survival rate. Because of the increased risk of serious postsplenectomy sepsis among young children, splenectomy is reserved preferably for patients older than the age of 6 years. Splenectomy for hereditary spherocytosis before this age should be performed only in cases of severe transfusion-dependent disease and only after the age of three. Additionally, those with symptomatic gallstones should be considered for splenectomy and cholecystectomy.

IDIOPATHIC THROMBOCYTOPENIC PURPURA (ITP):

It is an acquired disorder in which platelets are destroyed by circulating IgG antiplatelet antibodies.[7] The spleen is the source of antiplatelet antibody production as well as the major site of platelet-antiplatelet antibody complex destruction by macrophage-induced

phagocytosis. It presents with purpura or ecchymosis, bleeding gums and bleeding into the gastrointestinal, urinary, or genital tract. Diagnosis made by thrombocytopenia with normal bone marrow. The spleen is typically normal size.

Platelet count is characteristically less than 50,000/mm3.[3] First line of treatment is with steroids, intravenous IgG or plasmapheresis. Splenectomy should be considered for patients with platelet counts <25,000/mm3, bleeding, failure with medical management and recurrence. Removal of accessory spleens must also be done.

WHITE BLOOD CELL MALIGNANCIES:

Lymphoma and leukaemia can produce hypersplenism in the course of disease. Patients with lymphocytic lymphoma and chronic lymphocytic leukaemia have splenic infiltration that causes splenomegaly and pancytopenia. Splenectomy can ameliorate the pancytopenia in these patients and improve survival rates.

Non-Hodgkin's lymphoma is the most common malignant neoplasm of the spleen.[6] The spleen is involved in 30–40% of cases. Primary splenic lymphoma is rare. Clinical presentation varies from vague constitutional symptoms to abdominal or pleuritic pain and early satiety related to

splenomegaly. Thrombocytopenia, anemia, and neutropenia are associated with the disease. CT typically reveals splenomegaly with a solitary large mass but multiple masses may be seen. Splenectomy is indicated in patients with systemic disease and splenomegaly with cytopenias.

HODGKIN'S DISEASE STAGING:

Staging laparotomy in Hodgkin's disease provides accurate staging and more precise therapy. Splenectomy remains an essential part of staging laparotomy because the spleen was the only tissue that contained Hodgkin's disease in majority of patients.[17]

SPLENIC ABSCESSES:

Splenic abscess is a rare and potentially fatal illness.

Predisposing illnesses include:

- Malignancies
- endocarditis
- previous trauma
- hemoglobinopathy
- intravenous drug abuse
- AIDS

Route of spread of abscess is hematogenous (endocarditis, osteomyelitis, IVDA) or due to infection of a nearby structure, such as the colon, kidney, or pancreas. [4]

Most infections are polymicrobial and include such organisms as Staphylococcus, Salmonella, and Escherichia coli, Proteus mirabilis, Streptococcus group D, Klebsiella pneumoniae, Peptostreptococcus species, Bacteroides species, Fusobacterium species, Clostridium species, Candida albicans, and mycobacterium.

Fungal abscesses (Candida) are seen in immunocompromised patients.

The symptoms are usually nonspecific such as malaise, weight loss, left upper quadrant pain, and fever. CT abdomen is diagnostic.

US- or CT-guided percutaneous aspiration and catheter drainage is considered first-line therapy in uncomplicated solitary lesions, critically ill patients, and paediatric patients in whom splenic conservation is important.[14]

Splenectomy is indicated in multilocular abscesses and failed percutaneous drainage

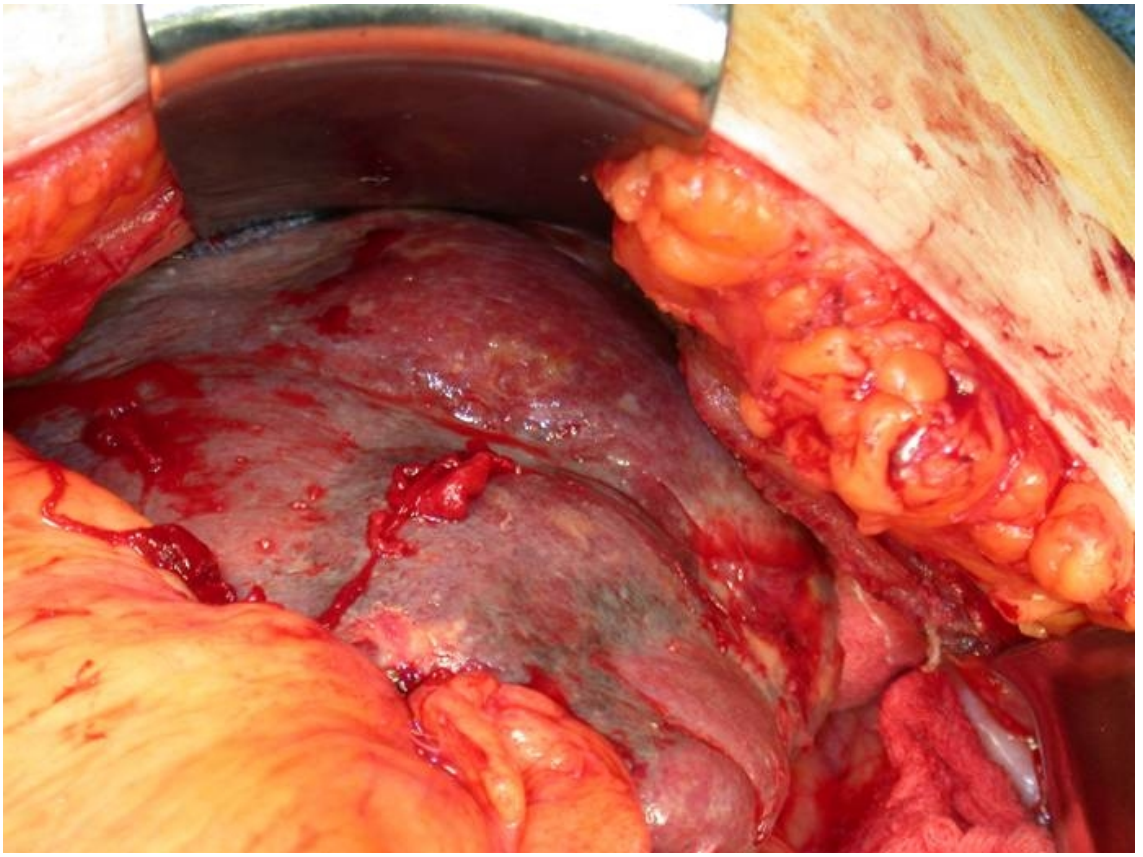


Fig 6: Multiple splenic abscesses.

Fig 7: Specimen showing splenic abscess.

SPLENIC CYSTS:

Cysts are classified as primary or secondary.

Primary cysts have an epithelial lining and can be nonparasitic or parasitic.

Nonparasitic Cysts:

These cysts are classified based on cellular lining and the etiology (neoplastic, traumatic or degenerative).The non parasitic cysts include the following (in decreasing order of frequency): pseudo cysts, hemangiomas, epidermoid cysts, and dermoid cysts.

Simple congenital cysts:

- lined by flattened or cuboidal cells from of peritoneal mesothelium.

-Usually small and asymptomatic.

-Small lesions do not require excision;

-larger lesions are removed by laparoscopic or open splenectomy.

Epidermoid cysts of the spleen:

-occur in children and in young adults. Symptoms depend upon the size and splenectomy is recommended for large or symptomatic cysts.

True dermoid cysts of the spleen:

Very rare. These cysts are lined by squamous epithelium with dermal appendages such as hair follicles and sweat glands. Splenectomy is indicated.

Parasitic Cysts:

-most common species causing hydatid cyst is Echinococcus granulosis.

-cysts are usually unilocular with an inner germinal layer (endocyst) and an outer laminated layer (ectocyst) surrounded by a fibrous capsule.

-they are filled with fluid under positive pressure, and contain daughter cysts and infective scolices.

- The passive hemaglutination test provides the best diagnostic specificity and sensitivity.

-Ultrasound or CT shows a cystic mass that is septated and contains daughter cysts.

-percutaneous aspiration with irrigation with hypertonic saline can be done.

-Splenectomy is the treatment of choice. Care should be taken to avoid intraoperative spilling the contents of the cyst must be avoided. It may lead to anaphylactic shock.

Secondary Cysts:

Pseudo cysts do not have an epithelial lining and comprise 70–80% of splenic cysts. (Fig 8,9).Trauma is most common antecedent factor. Malaria, infectious mononucleosis, tuberculosis, and syphilis are all predisposing factors.

The most common symptom is left upper quadrant pain radiating to the left shoulder or chest. They may present with acute symptoms related to rupture, hemorrhage, or infection.

Ultrasonography, CT or MRI are diagnostic.

Small asymptomatic pseudo cysts (<4 cm)-no treatment required.

Symptomatic pseudo cyst- percutaneous drainage or partial splenectomy.

Large symptomatic pseudo cyst- requires splenectomy.

Spillage of cyst contents may precipitate an anaphylactic shock and risks intraperitoneal dissemination of infective scolices. The cysts may be sterilized by injection of a 3% sodium chloride solution, alcohol, or 0.5% silver nitrate.[4]

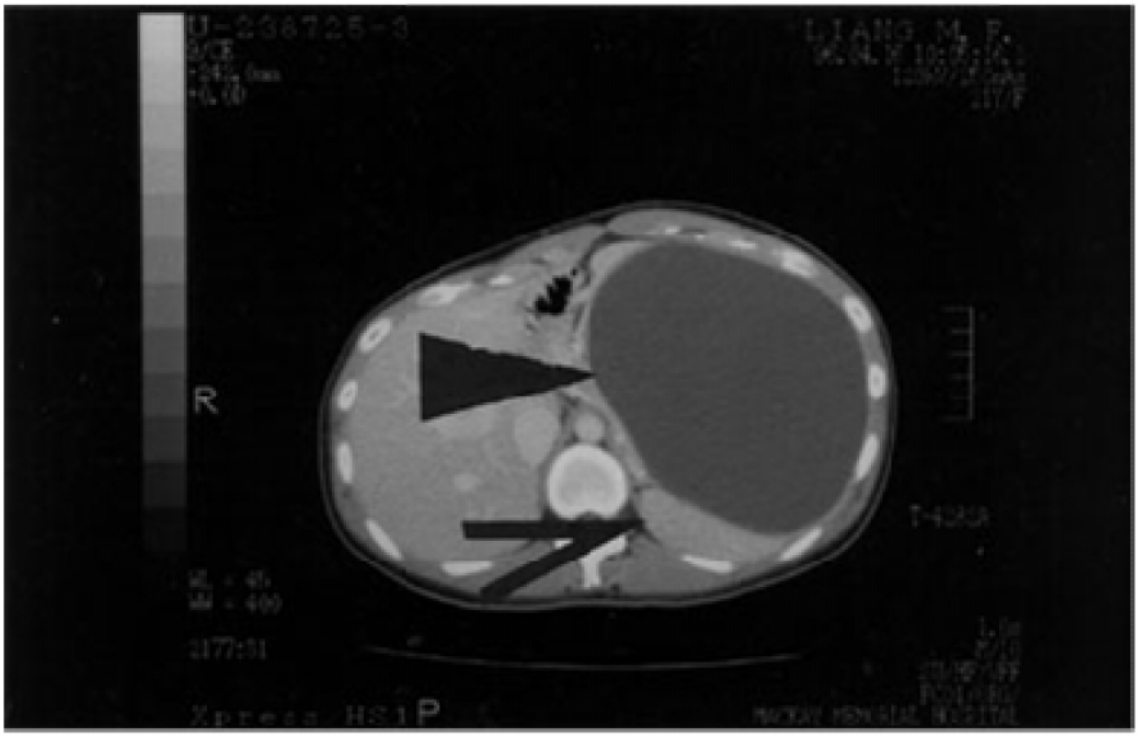


Fig 8: Simple splenic cyst

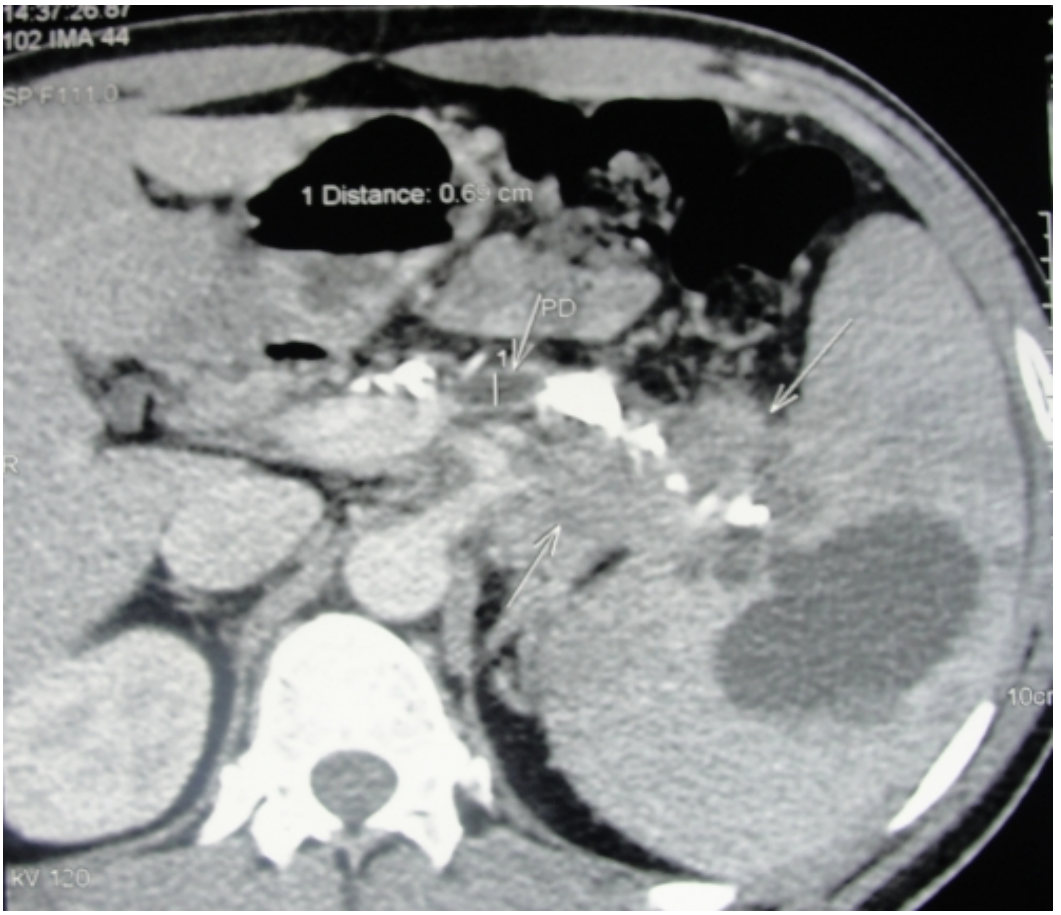


Fig 9: Pseudo cyst of pancreas within the spleen. Also seen are multiple calcifications in pancreatic duct.

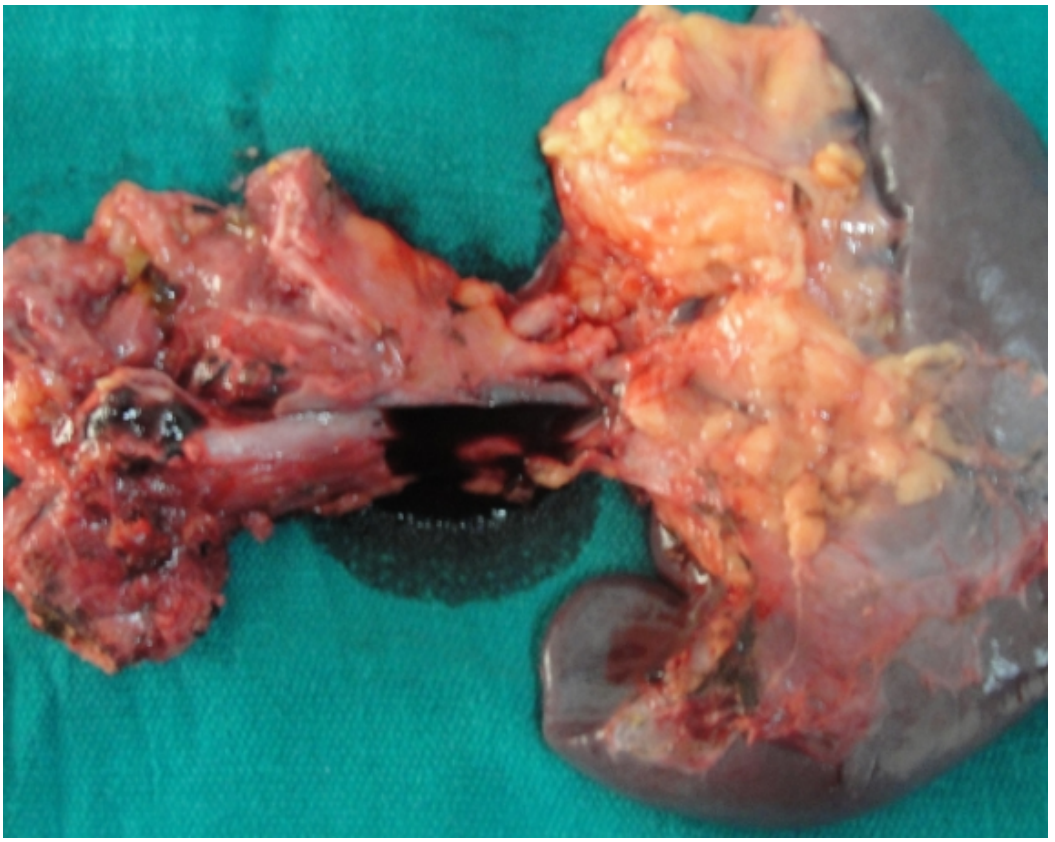


Fig10: Pseudo cyst of pancreas within the spleen.

Splenic Tumours:

Primary tumours of the spleen are very rare entities. The treatment of choice for splenic tumours is splenectomy. The most common splenic tumours are vascular neoplasms: hemangiomas, hemangioendothelioma, Lymphangioma, and hamartoma.[5]

TUMOURS OF THE SPLEEN:

I. Lymphoproliferative disorders:

Non-Hodgkin's lymphoma

Hodgkin's disease

Chronic lymphocytic leukaemia

Hairy cell leukaemia.

Acute lymphoblastic leukaemia

Waldenström's macroglobulinemia

Plasmacytoma

II. Myeloproliferative disorders:

Chronic myelogenous leukaemia

Myelofibrosis (agnogenic myeloid metaplasia)

Polycythemia vera

Essential thrombocythemia

III. Vascular tumours:

Benign :

Hemangiomas

Hamartoma

Lymphangioma

Malignant :

Angiosarcoma

Hemangiosarcoma

Lymphangiosarcoma

IV. Metastatic tumours

Breast, lung, melanoma, cervix, etc.

V. Others

Lipoma

Malignant fibrous histiocytoma

Fibro sarcoma

Leiomyosarcoma

Malignant teratoma

Kaposi's sarcoma

BENIGN NEOPLASMS:

Hemangioma:

The most common primary neoplasm of the spleen is hemangiomas. [2]The lesion can be single or multiple. Hemangiomas vary from well-circumscribed to irregular vascular proliferations. The majority are cavernous in nature. The potential for malignant transformation to angiosarcoma is very low. On CT scan, hemangiomas appear as

homogeneous, hypo dense or multicystic lesions with variable calcification, and peripheral enhancement. Most splenic hemangiomas are asymptomatic, with symptoms being associated with enlargement of the tumor and mass effect or rupture. Splenectomy is reserved for large and symptomatic lesions.

Lymphangioma of the spleen:

It is composed of a malformation of lymphatics. Microscopically, these endothelium-lined spaces are filled with lymph and blood elements. The lesion may be focal or multiple, a small or large cystic mass, or may diffusely involve the spleen. Cystic spaces of varying sizes with clear gelatinous fluid may account for splenomegaly. The diagnosis is made by ultrasound or CT scan, which reveals cystic lesion(s) of the spleen. Symptoms are related to the size and mass effect of the lesion as well as bleeding, rupture, consumptive coagulopathy and hypersplenism. Splenectomy is indicated for symptomatic lesions. Partial splenectomy is reserved for small, focal symptomatic lesions.

Other benign splenic tumors, such as angiomyolipoma, lipoma, hemangiopericytoma, and fibroma are rare.

PRIMARY MALIGNANT TUMORS:

Primary, nonlymphoid, malignant tumors of the spleen are exceedingly rare. These include angiosarcomas, malignant fibrous histiocytomas, and plasmacytomas.

ANGIOSARCOMA:

It is the most common nonlymphoid primary malignant neoplasm of the spleen[2]. Cut section shows stroma with vascular channels lined by enlarged endothelial cells. Associated with exposure to a arsenic, Thorotrast, and vinyl chloride. Presents with abdominal pain, left upper quadrant abdominal mass, and constitutional symptoms. Metastasis is frequent and often involves the liver. CT imaging often identifies a splenic lesion with central necrosis. The primary treatment is splenectomy. Cisplatin-based chemotherapy has also been used. Splenic angiosarcomas hold a poor prognosis with survival measured in months.

METASTATIC TUMORS:

The most common primary tumors associated with splenic metastasis are lung, stomach, pancreas, breast, melanoma, and colon. It is usually an incidental finding in an abdominal CT scan, or a laparotomy. Up to 88% of patients with splenic metastases have concomitant liver or

pancreatic metastases.13 Splenectomy is indicated if no other sites of disease are found on thorough evaluation.

Histological Basis for Splenic Resistance:

The contraction theory by Kettle: the rhythmic contractions provided by the sinusoidal splenic architecture prevent implantation of malignant cells on vascular endothelial cells.

The second theory states that the scarcity of lymphatic vessels extending into the intrasplenic parenchyma also limits splenic metastases.

Functional Theory of Splenic Resistance:

The spleen's immunologic and antitumorigenic properties are likely to be responsible for the rarity of splenic metastases.

The production of antineoplastic substances inhibiting tumour growth.

The specific tumour-inhibitory T-cells.

Surgery of the Spleen:

- ✓ The surgical procedures of the spleen include
- ✓ total open splenectomy,

- ✓ partial splenectomy,
- ✓ laparoscopic splenectomy,
- ✓ splenic repair,
- ✓ splenic fixation,
- ✓ Splenopexy,
- ✓ staging laparotomy,
- ✓ transplantation,
- ✓ incision and draining of parasitic or nonparasitic cysts and
- ✓ Removal of accessory spleens.

Surgery of the spleen is the surgery of its ligaments, vessels, and segments.

SPLENECTOMY:

TOTAL OPEN SPLENECTOMY:

There are two approaches,

In the anterior approach, the surgeon first incises the gastro colic ligament, allowing entry to the lesser sac, and then ligates the splenic artery.

In the posterior approach, the surgeon ligates the splenic artery after incising the posterior layer of the splenorenal ligament and mobilizing the

spleen to the right, thereby working within the greater peritoneal cavity. The aim of both approaches is the ligation of the splenic pedicle.[9]

A mass ligation of the splenic pedicle after incision of the posterior part of the splenorenal ligament includes the following structures: the presplenic fold, gastrosplenic ligament, splenic artery, and the incised portion of the splenorenal ligament.

PARTIAL OPEN SPLENECTOMY:

Every attempt should be made to preserve the spleen in the paediatric population, in whom exposure to encapsulated organisms may be quite limited.

In the older population (greater than age 30) splenic preservation will be determined primarily by the condition of the spleen (grade of injury) and the condition of the patient (hemodynamic and metabolic stability).

Administration of polyvalent antipneumococcal vaccine before surgery, plus a broad-spectrum antibiotic administered in three doses — one prior to surgery and two after the surgery helps in preventing post operative sepsis.

Laparoscopic Splenectomy:

Laparoscopic splenectomy is evolving and may become the procedure of choice for the treatment of splenic disorders.

Shorter hospitalization and fewer postoperative complications.

CONTRAINDICATIONS FOR SPLENECTOMY:

In at least three diseases — sickle-cell anaemia, cold antibody immune haemolytic anaemia, and glucose-6-phosphate deficiency — splenectomy is of little benefit to the patient, and therefore rarely indicated.

There are three different types of splenectomy.

The first type is the rapid, safe excision of a normal- or almost normal-sized spleen (trauma).

The second type of splenectomy is excision of a massively enlarged spleen (hypersplenism).

The third type of splenectomy is staging splenectomy for Hodgkin's disease.[2]

INCISIONS:

The midline incision is quick and easy to make, and results in little loss of blood.[1]

It helps to explore the entire abdomen and to deal with any other associated problems, such as gallstones, lacerated liver, and splenosis, and to perform multiple biopsies, if necessary.

The left sub costal incision, also, can give adequate exposure for a splenectomy.

It is appropriate for a mass in a normal-sized spleen or even a spleen that is twice the normal size, or when no other abdominal procedures are contemplated.

PREOPERATIVE PREPARATION:

There is no specific treatment required for the preoperative management of patients undergoing splenectomy.

Platelets should not be administered preoperatively in patient with idiopathic thrombocytopenic purpura because these cells will not survive.

In patients with myeloproliferative disorders who have a tendency to develop thrombosis, low-dose heparin, 5000 units twice daily, and aspirin on the day before surgery is given and advised to continue this regimen for 5 days postoperatively.

In elective cases, vaccines against Streptococcus pneumonia, Haemophilus influenza type B, and Neisseria meningitides are administered 14 days before operation and as soon as possible for emergency cases.

A nasogastric tube is used during the operation to decompress the stomach and to facilitate transection of the short gastric veins.

OPERATIVE TECHNIQUE:

A midline incision is generally applied to cases of traumatic injury because of the speed of access as well as exposure of the spleen and other possibly injured viscera.

A sub costal incision also has been employed, particularly for marked splenomegaly.

Increasingly, laparoscopic techniques are applied to splenic disease, and laparoscopic splenectomy is considered to be the gold standard by current standards except perhaps for the markedly enlarged spleen.[14]

The lesser sac is entered through the left part of the gastro colic omentum.[30] Moving upward along the greater curvature of the stomach, the short gastric veins are divided with clamps and ties or divided. If the highest short gastric vessels are difficult to visualize, they can be ligated and divided after the spleen is mobilized.

The splenocolic ligament between the spleen and the splenic flexure of the colon is divided, reflecting the colon downward.

Retracting the spleen to the patient's right, the peritoneum lateral to the spleen is opened and the splenorenal and splenophrenic ligaments are divided.[12]

The operator's hand is passed behind the spleen and tail of the pancreas, mobilizing the spleen anteriorly and medially by blunt dissection until the spleen is brought up anteriorly into the operative field.[23]

Any remaining short gastric vessels between the spleen and stomach are divided, retracting the stomach to the patient's right.

The splenic artery is isolated just distal to the tail of the pancreas and ligated. Next the splenic vein is separately ligated and the spleen is removed.[16]

The retro peritoneum up into the left subphrenic space is thoroughly inspected for hemostasis.

Drainage is not necessary unless the pancreas has been injured.

A search for accessory spleens should be conducted during elective splenectomy. They are present in approximately 12–20% of patients and may be the source for inadequate response to splenectomy in the treatment of hematologic disease, such as ITP.

The splenic hilum, gastrosplenic ligament, gastro colic ligament, greater omentum, mesentery and presacral space are potential sites for accessory spleens, with the splenic hilum being most common.[13]

COMPLICATIONS OF SPLENIC SURGERY:

Total Splenectomy:[10]

Early postoperative bleeding: Monitoring and early re-exploration to evacuate the hematoma is the treatment of choice.

Alternative therapy would be angiography with embolization but this may be difficult as the most common site of bleeding is a short gastric vessel.

There are two major sources of such bleeding:

(1) bleeding from polar arteries arising proximal to the ligation and

(2) Retrograde bleeding from splenic arteries distal to the ligation (short gastric, caudal pancreatic and left gastroepiploic arteries may arise from terminal branches of the splenic artery beyond the point of ligation).

Where possible, the ligation should be distal to the origin of the left gastroepiploic artery.

If the splenic vein is injured, the spleen must be removed or the vein must be anastomosed to another vein.

Left lower lobe atelectasis occurs more frequently following splenectomy.

The platelet count may rise to very high levels, at times greater than 2 million/mm^3, but no specific therapy other than hydration is generally indicated.

If medical therapy is thought to be appropriate, a drug that inhibits platelet aggregation, such as acetylsalicylic acid can be used.

Thrombosis of the splenic vein, with extension into the portal vein and superior mesenteric vein occurs mostly in patients with myeloproliferative disorders or in those with sepsis as a consequence of intra-abdominal abscess.

Fulminant sepsis related to Pneumococcus or to H. influenza occurs more commonly in patients who are immunosuppressed or have myeloproliferative diseases with a propensity for infection. The risk may be reduced with appropriate vaccination and early recognition as previously noted.

Injury to the tail of the pancreas is a potential risk of splenectomy, occurring in 15% or less. The majority of these injuries is self-limited with hyperamylasemia and pain but may be more severe with development of a pancreatic fistula.

ORGAN INJURY:

Diaphragm:

If diaphragmatic injury involves the entire thickness, the defect should be repaired.

Pancreas:

The close proximity of the tail of the pancreas may result in pancreatic injury. The injury may involve pancreatic ducts, pancreatic vessels, and the tail of the pancreas. Injury of ducts and/or vessels should be treated by

ligation. Resection of the pancreatic tail is necessary when it is severely injured.

Stomach:

Injury to the stomach or ischemia of the gastric remnant may accompany splenectomy and the sacrifice of the short gastric arteries. With gastric injury superficial to or through the total thickness of the gastric wall, gastrorrhaphy is the procedure of choice.

The conditions that predispose to the formation of gastric fistula after splenectomy:

Abrasions of the serosal covering of the greater curvature of the stomach, which often results from a technically difficult splenectomy.

Arteriosclerosis of the gastric vessels.

An organizing hematoma in the gastrosplenic omentum secondary to rupture of the spleen.

Severe trauma with multiple injuries or predisposing to stress ulcerations.

Colon:

The distal transverse colon, the splenic flexure, and the proximal descending colon may be injured during splenic surgery.

The segments related to the spleen via the splenocolic and phrenicocolic ligaments are the most vulnerable.

Gentle treatment and ligation of these ligaments will avoid colon injury.

Colonic wall repair in two layers is the procedure of choice.

Kidney, Ureter, Adrenal, and Retroperitoneal Space:

Occasionally, a mega spleen is heavily fixed to the left adrenal gland, the left kidney, and the left ureter. The ureteric part involved is again related to the size of the spleen. Other Organs

The adhesions of loops of small bowel and the left ovary and tube secondary to malaria and kala azar. Small bowel resection and left salpingo-oophorectomy is needed.

Partial Splenectomy:

Bleeding from the preserved splenic remnant.

Infarction of the splenic remnant is possible.

Iatrogenic Splenosis

Laparoscopic Splenectomy:

The anatomic complications of laparoscopic splenectomy are those of total and partial splenectomy.[10]

The complication rates for laparoscopic splenectomy have been limited at less than 20%.

One complication that may occur during laparoscopic splenectomy that is rarely seen with open splenectomy is diaphragmatic perforation, usually related to thermal injury during mobilization of the superior pole.

Essential to avoid parenchymal rupture and cell spillage as well as to avoid leaving accessory spleens, which can lead to the failure of surgical treatment.

Laparoscopic splenectomy by experienced laparoscopic surgeons is feasible, effective, safe, and offered several advantages over open surgery

EFFECTS OF SPLENECTOMY:

There are many characteristic post splenectomy changes:

Because the spleen is no longer pitting and culling red cells, nuclear remnants remain in the form of Howell-Jolly bodies and the absence of these remnants indicates the presence of residual splenic tissue.

Residual splenic function after splenectomy can be assessed by measuring pitted red cell percentage, which correlates with tuftsin activity.

Multiple membrane abnormalities can also be seen in the red cells of asplenic patients.

Leukocytosis occurs after splenectomy usually returning to normal after a few months.

Thrombocytosis occurs immediately after splenectomy in the majority of patients. The serum levels of two important opsonins, tuftsin and properdin are decreased resulting in increased susceptibility of asplenic patients to infection from encapsulated organisms.

OVERWHELMING POSTSPLENECTOMY SEPSIS (OPSS):

The risk of OPSS persists over the patient's lifetime, with approximately 42% of cases occurring more than 5 years after splenectomy.

Asplenic patients have a five-fold increased risk for fatal sepsis. Reticuloendothelial dysfunction caused by hematologic disease or immunosuppression, increases the likelihood of sepsis.

Young children are at increased risk because of the immaturity of the immune system.

Streptococcus pneumonia is the most common organism causing OPSS. Other organisms are Haemophilus influenza, Neisseria meningitides and malaria.

Additionally, other pneumococcal, Haemophilus non-type B, and meningococcal strains as well as other bacteria may cause overwhelming infection.

Meningitis, particularly among children, and pneumonia are seen. They present with initial prodrome of fever, myalgia, emesis, headache, and abdominal pain. These early symptoms can quickly escalate into profound septic shock, accompanied by disseminated intravascular coagulation, and organ failure. Asplenic patients should be instructed to seek immediate medical attention at the first sign of illness.

Daily penicillin prophylaxis for the first 2 years postsplenectomy, particularly for children younger than 5 years old is advised.

VACCINATION:

Vaccination does not imply immunity and the pneumococcal vaccine is only 70% protective even in the immunocompetent host.

Vaccines are given against pneumococcal (Pneumovac), meningococcal (A, C, Y, W-135) and also H.influenza type b.

They are given 2 weeks prior to surgery in elective cases and 2 weeks after surgery in emergency surgeries.

Booster doses are given once in 3-5 years.

Patients with immunoproliferative disorders, immunosuppressed states because of chemotherapy, and hematologic disease such as sickle cell anemia, may need more frequent pneumococcal revaccination.

Pneumococcal antibody titers can be obtained to assess immunity; but the required level of antibody protection is uncertain.

ADVERSE REACTIONS OF THE VACCINES:

Fever.

Hypersensitivity reactions

AIMS AND OBJECTIVE

AIMS AND OBJECTIVES:

The purpose of this study is to evaluate various diseases of the spleen requiring surgical management apart from trauma. This study was conducted in the department of general surgery, govt. Stanley hospital and the data for a period of three years was analyzed.

The objectives are:

- To study the aetiology and clinical presentation of the diseases of the spleen that requires surgical intervention.
- To study the pattern of indications for splenectomy for a 3 year period.
- To study the importance of vaccination in patients undergoing splenectomy.
- To study the complications following surgical management of the diseases of the spleen especially overwhelming post splenectomy sepsis.

MATERIALS AND METHODS

MATERIALS & METHODS

Setting	:	Department of General Surgery, Government Stanley Hospital, Chennai
Study design	:	RETROSPECTIVE ANALYTICAL STUDY
Study period	:	3 years
Materials	:	50 patients
Inclusion criteria	:	Patients undergoing splenectomy.
Exclusion criteria:		Patients undergoing splenectomy for trauma.

METHODS:

A proforma will be made that includes detailed history, physical examination, basic investigations and other relevant investigations required. All patients diagnosed with splenic pathology (excluding trauma) requiring splenectomy will be included in the study. Patients are taken up for surgery after administration of Pneumococcal and H.Influenza B vaccine 2 weeks prior to surgery. The intraoperative findings are documented, and resected specimen is sent for HPE. Postoperatively, diagnosis is confirmed by the histopathological report of the resected specimen. Subsequently, the various indications are statistically analysed.

RESULTS AND ANALYSIS

Table 1:

S.No	Age groups	No of cases
1	20-40	26
2	40-60	15
3	60 and above	9

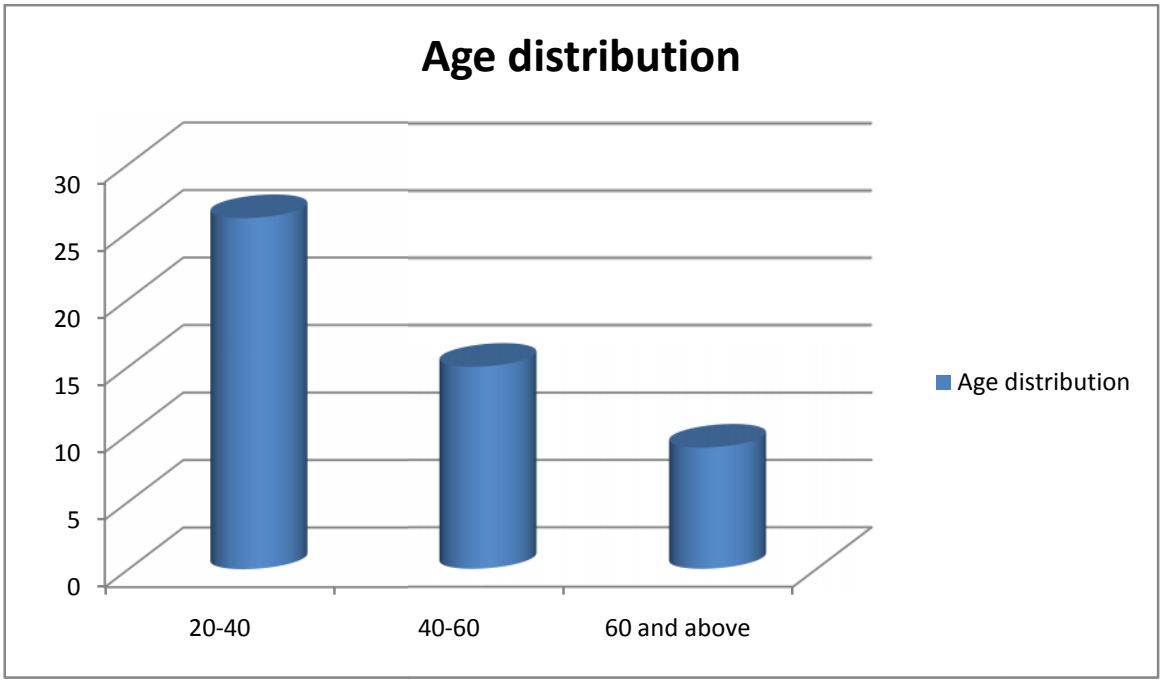


Table 2:

S.No	Sex	No of cases
1	MALE	31
2	FEMALE	19

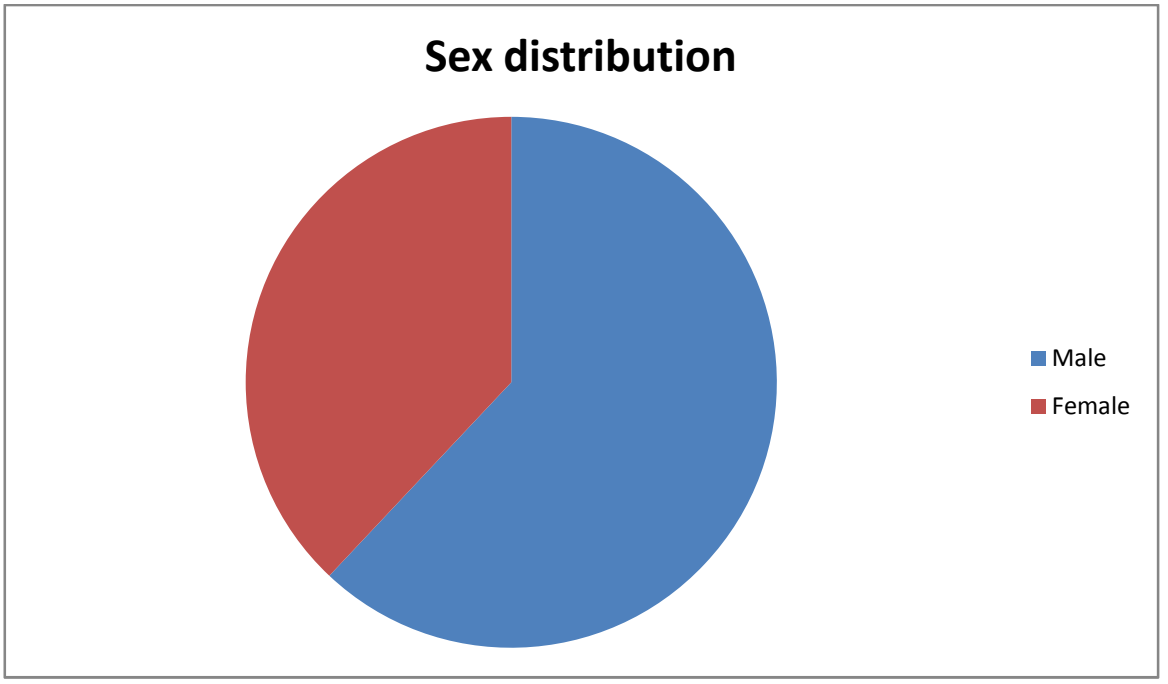


Table 3:

S.No	Aetiology	No of cases
1	INCIDENTAL	20
2	HEMANGIOMA	4
3	SPLENIC CYST	4
4	SPLENIC ABCESS	7
5	EXTRA HEPATIC PORTAL VENOUS OBSTRUCTION	6
6	NON CIRRHOTIC PORTAL FIBROSIS	6
7	IDIOPATHIC THROMBOCYTOPENIC PURPURA	3

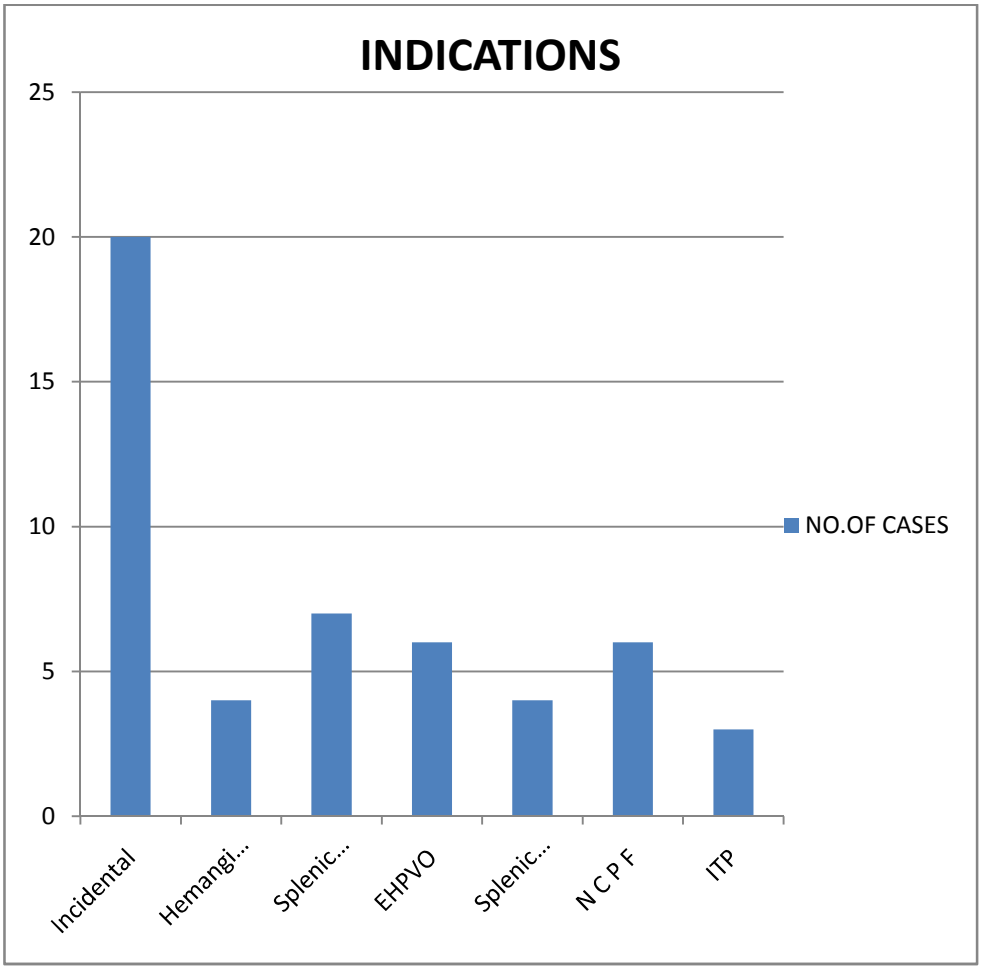


Table 4:

S.No	Pneumovac	No of cases
1	Pre operative	30
2	Post operative	20

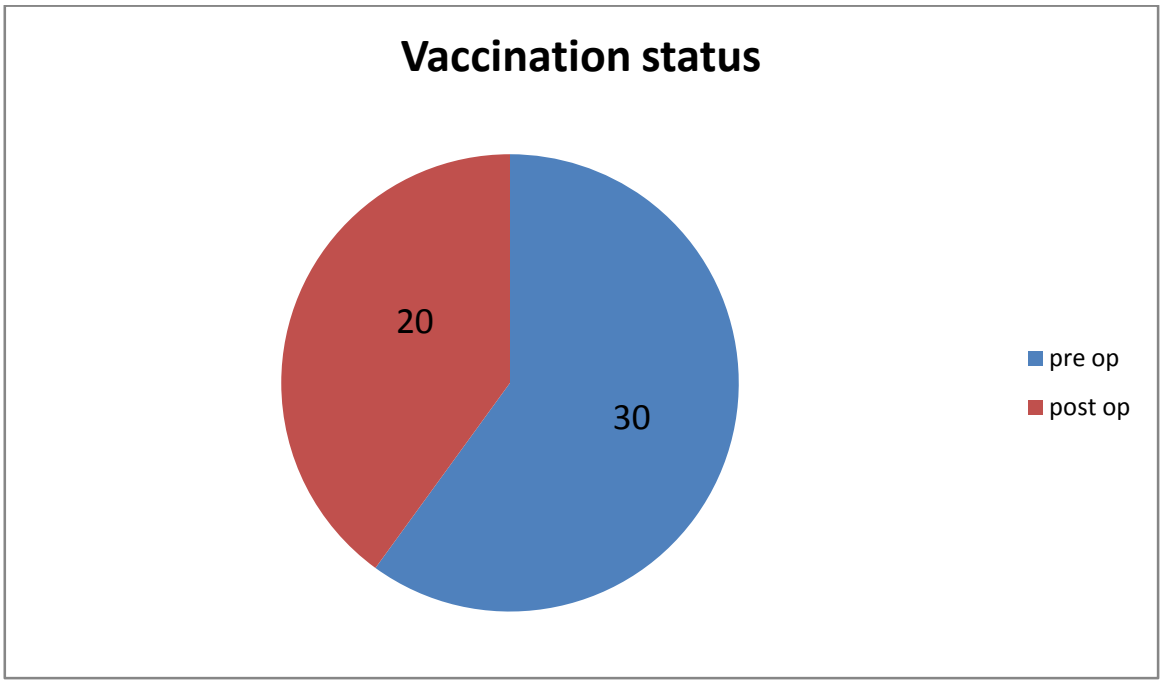
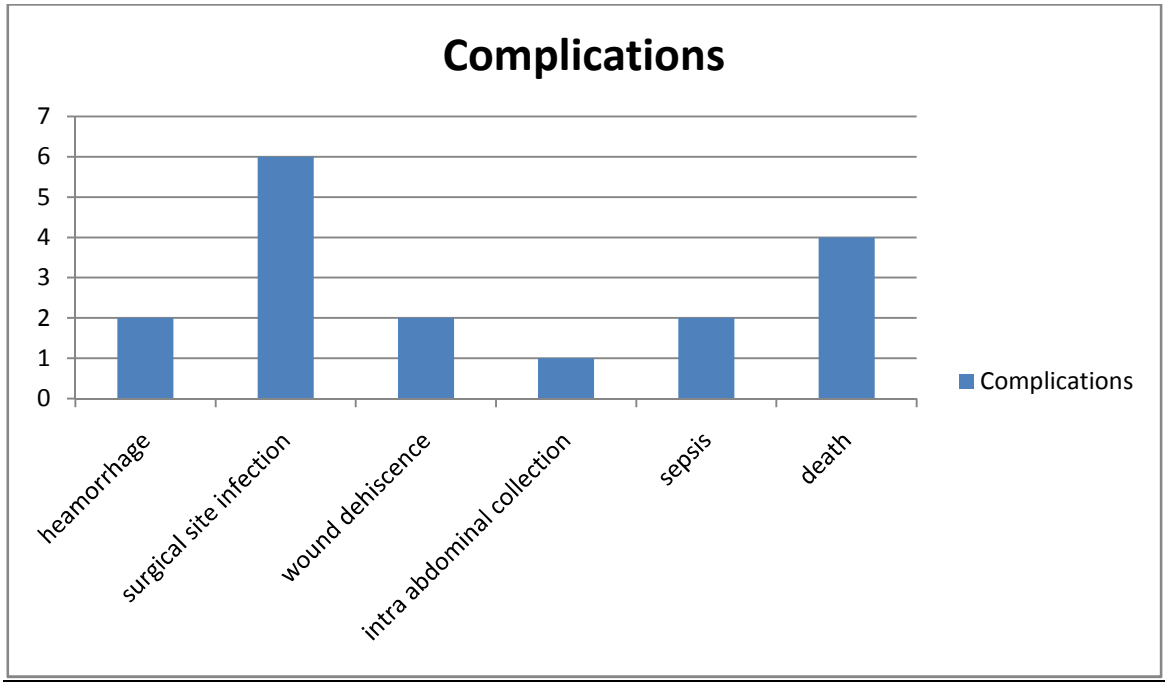


Table 5:

Complications	No of cases
Haemorrhage	2
Surgical site infection	6
Wound dehiscence	2
Intra abdominal collection	1
Sepsis	2
Death	4



DISCUSSION

DISCUSSION:

This study shows that diseases requiring splenectomy are more common in males.

The middle age (20-40) is the most common age group afflicted.

The most common indication for splenectomy in this study was actually along with resection of adjacent structures for diseases not primary to spleen. The spleen had to be sacrificed in these procedures due to infiltration of malignancy from stomach, tail of pancreas and retroperitoneal structures. Spleen also had to be removed due to compression of splenic or portal vein by the tumour or thrombosis of splenic vein due to chronic calcific pancreatitis. This group accounted for as high as 40% of the cases.

The next most common disease requiring splenectomy was splenic abscess. About 7 patients were diagnosed to have splenic abscess on imaging studies. All of them underwent splenectomy.

There were 6 cases of Extra hepatic portal venous obstruction causing portal hypertension and variceal bleeding. All of them underwent proximal splenorenal shunt with splenectomy.

6 patients presented with huge splenomegaly and were diagnosed to be non -cirrhotic portal fibrosis. They underwent splenectomy with proximal splenorenal shunt.

Splenic cyst was the diagnosis in 4 patients out of which one had pseudocyst of tail of pancreas within the substance of spleen. Rest were simple cysts.

4 patients were identified to have idiopathic thrombocytopenic purpura by blood investigations and imaging.

Haemangioma of spleen was the diagnosis in 4 patients by imaging studies and underwent splenectomy.

All the patients were given preoperative vaccination against encapsulated bacteria except 20 patients whose spleen were removed along with other neighbouring structures. They were administered vaccines within 72 hours of surgery.

15 out of 50 patients developed complications. The most common complication was superficial surgical site infection in 6 patients who were managed conservatively with antibiotics and regular wound dressings.

2 patients developed early post operative haemorrhage. They were managed conservatively. 2 patients developed signs of sepsis like fever,

tachycardia and leucocytosis and needed ICU care. These patients incidentally had surgeries for gastric fundal malignancies.

1 patient developed left subphrenic abscess which was drained under ultrasound guidance. 4 patients died in the study did not have primary splenic pathology but had intra abdominal malignancies. These patients underwent en bloc resections and hence the death could be attributed to the primary malignancy.

CONCLUSION

CONCLUSION:

This study shows that splenectomy has been performed most commonly for malignancies of adjacent structures due to direct infiltration or thrombosis of splenic or portal vein. Regular vaccination in all patients undergoing splenectomy decreased the incidence of septic complications. All the patients should be educated regarding risk of infections and should be followed up at least for 2 years. Vaccination status should be documented and re vaccination schedules should be informed to the patient before discharge.

ABSTRACT

Background:

The spleen is considered to be the largest lymph node of the body. The indications of splenectomy have changed in the past 2 decades. Apart from trauma, which is still the leading cause for surgical removal, there have been other conditions which have benefitted from splenectomy. Patients without a spleen are at the risk of overwhelming post-splenectomy sepsis. Prophylactic vaccination and strict follow up have reduced their incidence.

Materials and Methods:

50 patients who underwent splenectomise for non-traumatic indications in the past three years were analysed. A complete evaluation of every case, including history, physical examination and investigations was done to confirm the diagnosis. The patients were administered prophylactic vaccines before the surgery in 30 patients. In 20 patients where spleen was removed incidentally, vaccines were given in post operative period. The surgical procedure was documented and specimen was sent for histopathological analysis. The post-operative complications, if any and their management were recorded. For those patients followed

retrospectively, the required records were referred in various departmental registers.

Results:

Out of 50 patients studied, splenectomy was done in 20 patients as a component of multiple organ resections for gastric, pancreatic or retroperitoneal malignancies. In these cases of incidental splenectomies, spleen had to be sacrificed due to infiltration o malignancy into spleen or involvement of splenic vessels. Most common cause was carcinoma involving fundus of stomach. Next common cause was distal pancreatic tumours infiltrating hilum of spleen. There was a case of retroperitoneal sarcoma which resulted in removal of tumour along with left kidney and spleen. Most common local cause for surgery was splenic abscess in 7 patients. 6 patients each presented with features of hypersplenism attributable to non cirrhotic portal fibrosis and extra hepatic portal venous obstruction. Splenic cysts and hemangiomas were found in 4 patients each. The most common complication was surgical site infection. Death occurred in 4 patients in post operative period. Sepsis was encountered only in 2 patients and were managed in intensive care unit.

Conclusion:

The primary splenic pathologies requiring splenectomy have been few. Splenectomy is now undertaken more for hypersplenism and along with adjacent organs and the benefits have been defined. The risk of post splenectomy sepsis and the protection offered by vaccination have been stressed. Strict follow up of cases along with counselling and education to the patient is important.

BIBLIOGRAPHY

BIBLIOGRAPHY:

1. John E. Skandalakis. "Spleen", Anatomic Basis of Tumor Surgery, 2010.

2. Alan T. Lefor. "Spleen", Surgery, 2008.

3. Seymour I. Schwartz. "Role of Splenectomy in Hematologic Disorders", World Journal Of Surgery, 11/01/1996.

4. David G. Heidt. "Pancreas: Anatomy and Structural Anomalies", Textbook of Gastroenterology, 11/14/2008.

5. Alan T. Lefor. "Spleen", Essential Practice of Surgery, 2003.

6. Ali Nayci. "The Role of the Spleen on Colonic Anastomotic Healing", Journal of Investigative Surgery, 7/2003.

7. Chu, U.B. "Surgical management of splenic disease", Current Surgery, 2001, 01/02.

8. Michael Melnick. "Studies in neural tube defects II. Pathologic findings in a prospectively collected series of anencephalics", American Journal Of Medical Genetics, 04/1987.

9. “Spleen” Surgical Anatomy and Technique, 2009.

10. J.F. Gigot. "Present Status of Laparoscopic Splenectomy for Hematologic Diseases: “Certitudes and Unresolved Issues” Surgical Innovation, 09/01/1998.

11. "Pancreas", Surgical Anatomy and Technique, 2009.

12. Mark A. Taylor. "Staging laparotomy with splenectomy for Hodgkin's disease: The Stanford experience”. World Journal of Surgery, 06/1985.

13. George S. Abi Saad. "Isolated splenic metastasis from colorectal cancer", International Journal of Clinical Oncology, 01/22/2011.

14. P.J. Ooi, L.L. "Splenic abscesses from 1987 to 1995", The American Journal of Surgery, 199707.

15. Seok Kil Zeon. "Angiographic branching patterns of the splenic artery", International Journal of Angiology, 12/1998.

16. Carmine Napolitano. "Distal Splenopancreatectomy: Indications for Surgery and Technical Notes”, Surgical Treatment of Pancreatic Diseases, 2009.

17."Lymph Node Classification", A Guide for Delineation of Lymph Nodal Clinical Target Volume in Radiation Therapy, 2008.

18.Seyfettin Köklü. "Left-Sided Portal Hypertension", Digestive Diseases and Sciences, 04/13/2007.

19.Bailey and Love. *Short Practice of Surgery.* 25th. London : Edward Arnold (Publishers) Ltd, 2008. pp. 1130-1153.

20.Sabiston. *Textbook of Surgery.* 18th. US : 2007 Saunders, An Imprint of Elsevier, 2007.

21.Schwartz. *Principles of Surgery.* 8th. US : The McGraw-Hill Companies, 2007.

22.Consensus paper on the surveillance of surgical wound infections. *Am J Infect Control* 1992; 20: 263-270.

23.Agur AMR, Lee MJ, Grant JCB. *Grant's Atlas of Anatomy*. 10th ed. London, UK: Lippincott Williams and Wilkins; 1999.

24. Romanes GJ. *Cunningham's Manual of Practical Anatomy*. Vol II: Thorax and Abdomen. 15th ed. New York, NY: Oxford Medical Publications, Oxford University Press; 1986.

25. Grant JCB, Basmajian JV, Slonecker CE. *Grant's Method of Anatomy: A Clinical Problem-Solving Approach*. 11th ed. London, UK: Williams and Wilkins; 1989.

26. Gray H. Lewis WH, ed. *Gray's Anatomy of the Human Body*. 20th ed. New York, NY: Bartleby.com; 2000.

27. Sinnatamby CS. *Last's Anatomy: Regional and Applied*. 10th ed. Edinburgh, UK: Churchill Livingstone; 1999.

APPENDIX

Proforma

SPLENECTOMY-AN ANALYSIS OF THE VARIOUS INDICATIONS

Investigator : **Dr. T.PANNEER SELVAM**

PGY3 – MS (Gen Surgery)

Guide : **Prof. Dr. P. Darwin,** Chief, Unit S1

Name	:	Age/ Sex	:
I.P. No.	:		
Address	:		
Contact no	:		
D.O.A	:	D.O.S	:
D.O.D	:		
History and Physical	:		

Investigations:

HEMAT			**LFT**		
HB			T.BIL		
PCV			D.BIL		
RBC			AST		
TC			ALT		
DC			ALP		
PLT			T.PROTEIN		
ESR			S.ALB		
RBS FBS PPBS			P.T - T/C INR		
B.UREA			aPTT – T/C		
S.CREAT			PERIPHERAL SMEAR		
S.Na+			BONE MARROW		
S.K+					
S.Cl-			**BL.GROUP**		
S.HCO3-					

X RAY	
USG	
CECT ABDOMEN AND PELVIS	
OGD SCOPY	
HISTOPATH (FNAC/BIOPSY)	
OTHER	

OPINIONS

VACCINES

PER OP DIAGNOSIS

OPERATIVE PROCEDURE

ANESTHESIA

FINDINGS

DRAINS

BLOOD LOSS

SPECIMEN FOR HPE

POST OP HPE REPORT

POST OP COURSE

SPLENECTOMY-AN ANALYSIS OF THE VARIOUS INDICATIONS

Investigator : **Dr. T. PANNEER SELVAM**, PGY3 – MS (Gen Surgery)

Guide : **Prof. Dr. P. Darwin,** Chief, Unit S1.

Patient Information Module

You are being invited to be a subject in this study. Before you participate in this study, I am giving you the following details about this trial, which includes the aims, methodology, intervention, possible side effects, if any and outcomes.

All patients diagnosed with splenic pathology (excluding trauma) requiring splenectomy will be included in the study. Patients are taken up for surgery after administration of Pneumococcal and H.Influenza B vaccine 2 weeks prior to surgery. The intraoperative findings are documented, and resected specimen is sent for HPE. Postoperatively, diagnosis is confirmed by the histopathological report of the resected specimen. Subsequently, the various indications are statistically analysed. The results arising from this study will be analyzed and used for academic purposes. You will be given clear instructions at every step and you are free to ask/ clarify any doubts. Your identity will remain confidential. You are free to withdraw from this trial at any point of time, without any prior notice &/ or without any medical or legal implications. I request you to volunteer for this study.

Thanking You,

Investigator's Sign Patient's Sign

(Dr. T.PANNEER SELVAM.) (Name:)

SPLENECTOMY-AN ANALYSIS OF THE VARIOUS INDICATIONS

Investigator : DR.T.PANNEER SELVAM
PGY3 – MS (Gen Surgery)

Guide : **Prof. Dr. P. Darwin,** Chief, Unit S1.

Informed Consent

Name: Age/ Sex: IP:

I herewith declare that I have been explained in a language fully understood by me regarding the purpose of this study, methodology, proposed intervention, plausible side effects, if any and sequelae.

I have been given an opportunity to discuss my doubts and I have received the appropriate explanation.

I understand that my participation in this study is completely voluntary and that I am free to withdraw from this study at anytime without any prior notice &/ or without having my medical or legal rights affected.

I permit the author and the research team full access to all my records at any point, even if I have withdrawn from the study. However my identity will not be revealed to any third party or publication.

I herewith permit the author and the research team to use the results and conclusions arising from this study for any academic purpose, including but not limited to dissertation/ thesis or publication or presentation in any level.

Therefore, in my full conscience, I give consent to be included in the study and to undergo any investigation or any intervention therein.

Patient's Sign Investigator's Sign

(DR.T.PANNEER SELVAM)

1	Jayachandran	43	M	10720	CA STOMACH	TOTAL GASTRECTOMY WITH SPLENECTOMY
2	Vivek	40	M	11254	SPLENIC ABSCESS	SPLENECTOMY
3	Devaki	45	F	12541	INFILTRATING MUCINOUS ADENOCARCINOMA-TAIL OF PANCREAS.	DISTAL PANCREATECTOMY WITH SPLENECTOMY
4	Mahalakshmi	58	F	13264	HEMANGIOMA SPLEEN	SPLENECTOMY
5	Andal	65	F	15874	CA OESOPHAGO GASTRIC JUNCTION	TOTAL GASTRECTOMY WITH SPLENECTOMY
6	Ganesan	40	M	16523	SPLENIC ABSCESS	SPLENECTOMY
7	Senthil	25	M	11770	NCPF WITH PORTAL HYPERTENSION	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
8	Rangan	48	M	29046	SIMPLE SPLENIC CYST	SPLENECTOMY
9	Varadan	66	M	33410	CA OESOPHAGO GASTRIC JUNCTION	TOTAL GASTRECTOMY WITH SPLENECTOMY
10	Malar	38	F	33954	HEMANGIOMA SPLEEN	SPLENECTOMY

11	Vasanthi	26	F	41823	EHPVO WITH ESOPHAGEAL VARICES	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
12	Sumathy	28	F	41843	EHPVO WITH ESOPHAGEAL VARICES	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
13	Dhanapal	47	M	44898	SPLENIC ABSCESS	SPLENECTOMY
14	Thangaraj	57	M	43532	HEMANGIOMA SPLEEN	SPLENECTOMY
15	Senthil Kumar	25	M	5318	EHPVO WITH ESOPHAGEAL VARICES	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
16	Muniyappan	30	M	6183	ITP	SPLENECTOMY
17	Sethu Madhavan	41	M	3193	NCPF WITH PORTAL HYPERTENSION	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
18	Karpagam	45	F	11777	CA STOMACH -BODY	TOTAL GASTRECTOMY WITH SPLENECTOMY
19	Ponnammal	53	F	10343	HEMANGIOMA SPLEEN	SPLENECTOMY
20	Abdul Latif	40	M	24055	SPLENIC ABSCESS	SPLENECTOMY

21	Raja	28	M	24929	EHPVO WITH ESOPHAGEAL VARICES	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
22	Thangadurai	38	M	26843	CA STOMACH	TOTAL GASTRECTOMY WITH SPLENECTOMY
23	Anjali	61	F	32392	NCPF WITH PORTAL HYPERTENSION	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
24	Naveen	52	M	32190	CA STOMACH	TOTAL GASTRECTOMY WITH SPLENECTOMY
25	Munusamy	40	M	32300	HEMANGIOMA SPLEEN	SPLENECTOMY
26	Chinnaselvi	25	F	33920	EHPVO WITH ESOPHAGEAL VARICES	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
27	Muppidathi	36	F	33501	SPLENIC ABSCESS	SPLENECTOMY
28	Thahira	40	F	41982	CA STOMACH-FUNDUS	TOTAL GASTRECTOMY WITH SPLENECTOMY
29	Velu	45	M	44516	SEROUS CYSTADENOMA-TAIL OF PANCREAS	DISTAL PANCREATECTOMY WITH SPLENECTOMY
30	Sasikala	27	F	2188	NCPF WITH PORTAL HYPERTENSION	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY

31	Mariselvam	21	M	8579	EHPVO WITH ESOPHAGEAL VARICES	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
32	Ranganayaki	35	F	11972	SIMPLE SPLENIC CYST	SPLENECTOMY
33	Lakshmi	55	F	12844	SEROUS CYSTADENOMA-TAIL OF PANCREAS	DISTAL PANCREATECTOMY WITH SPLENECTOMY
34	Irulappan	85	M	15593	CARCINOMA FUNDUS OF STOMACH	TOTAL GASTRECTOMY WITH SPLENECTOMY
35	Ellammal	65	F	17601	SIMPLE SPLENIC CYST	SPLENECTOMY
36	Babu	55	M	18197	MUCINOUS ADENOCARCINOMA-TAIL OF PANCREAS	DISTAL PANCREATECTOMY WITH SPLENECTOMY
37	Varadhan	65	M	19827	CARCINOMA OESOPHAGO-GASTRIC JUNCTION	TOTAL GASTRECTOMY WITH SPLENECTOMY
38	Siva	32	M	24535	SPLENIC ABSCESS	SPLENECTOMY
39	Shakunthala	60	F	24549	ITP	SPLENECTOMY
40	Baskar	65	M	26687	MUCINOUS ADENOCARCINOMA -BODY OF PANCREAS	DISTAL PANCREATECTOMY WITH SPLENECTOMY

41	Kolanchinathan	27	M	28886	NCPF WITH PORTAL HYPERTENSION	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY
42	Mugunthan	44	M	30093	SPLENIC ABSCESS	SPLENECTOMY
43	Venkatachalam	65	M	30493	SIMPLE SPLENIC CYST	SPLENECTOMY
44	Deva	78	M	27586	CARCINOMA BODY OF STOMACH-INFILTRATING INTO TAIL OF PANCREAS	TOTAL GASTRECTOMY WITH DISTAL PANCREATECTOMY ANDSPLENECTOMY
45	Chandran	40	M	29986	CARCINOMA OESOPHAGO-GASTRIC JUNCTION	TOTAL GASTRECTOMY WITH SPLENECTOMY
46	Rajasekar	33	M	31203	SPLENIC ABSCESS	SPLENECTOMY
47	Gangadharan	57	M	31466	MUCINOUS ADENOCARCINOMA -TAIL OF PANCREAS	DISTAL PANCREATECTOMY WITH SPLENECTOMY
48	Yasoda	60	F	32807	ITP	SPLENECTOMY
49	Shankar	29	M	35504	PSEUDO CYST OF PANCREAS-SPLEEN	DISTAL PANCREATECTOMY WITH SPLENECTOMY
50	Krishnan	53	M	35534	NCPF WITH PORTAL HYPERTENSION	PROXIMAL SPLENORENAL SHUNT WITH SPLENECTOMY